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Bioenergetic, life-history modeling of sprat

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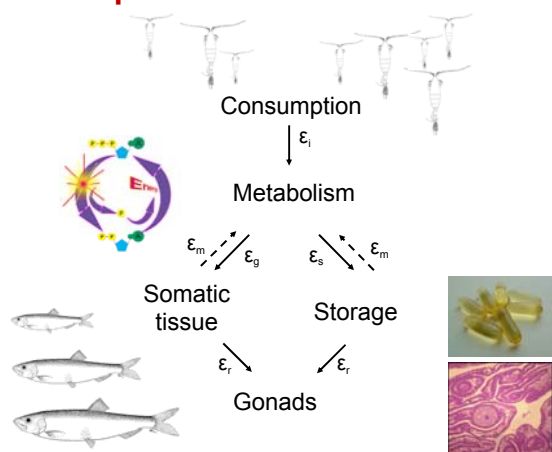
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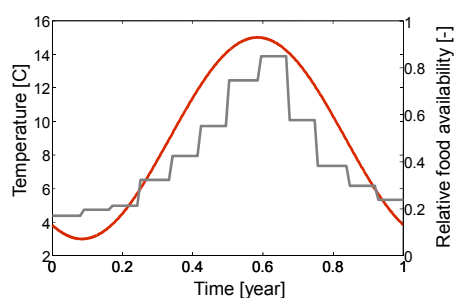
Our aim of this work is to develop a bioenergetic, life-history model of Baltic Sea sprat (*Sprattus sprattus balticus*) to use in conducting detailed recruitment studies. The task is to describe the strong and seemingly unpredictable year-to-year variation in the recruitment of sprat. Emphasis is on environmental forcing and its influence on the temporal and spatial patterns of egg production.

Model setup:



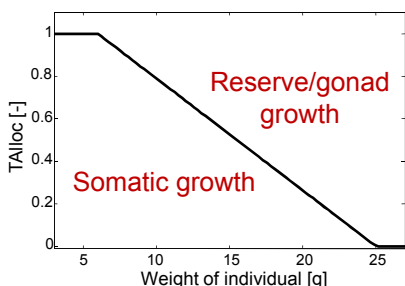
Energy allocation is determined by the condition and weight of the fish in addition to the season.

Forcing functions:



Temperature
(left axis)

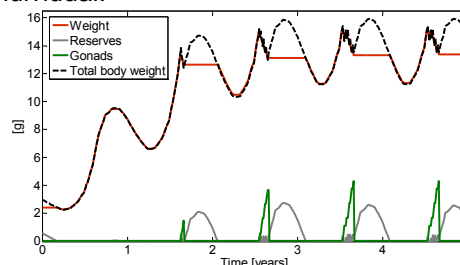
Food availability
(right axis)



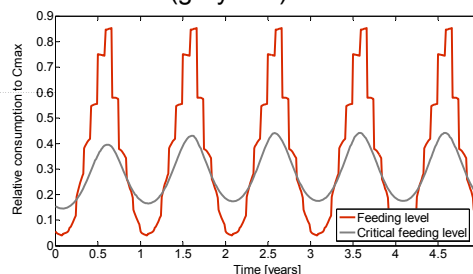
The allocation function, $TAlloc$, determines the amount of time used for somatic – and reserve and/or gonad growth and is determined by the size of the individual.

Preliminary results:

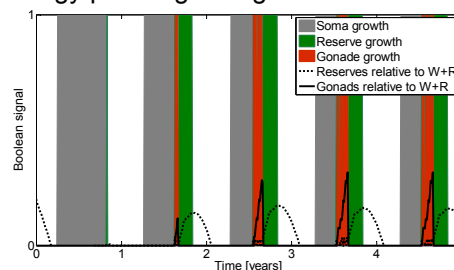
Growth curves with all energy pools and the total weight of the individual:



Actual feeding level (in red) and level needed to cover costs of metabolism (grey line):



Growth strategies taken by the individual in the simulation. The Boolean signal gives a value of 1 when a given energy pool is growing.



The results shown here are preliminary. Forthcoming focus is on the spatial aspect on the reproductive success of sprat, where our aim is to determine the relative importance of the choice of spawning - and feeding area. Furthermore, the model will be used for determining recruitment under different climate scenarios.

This research provides new insights into the most important processes determining growth and reproduction in sprat under variable environmental forcing as sprat has and will experience in the Baltic Sea. An improved understanding will enhance our predictive capabilities of the year-to-year variations in sprat recruitment.